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Clark

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(54) **TWIST LOCK OPTICAL HOLDER FOR RECESSED LIGHTING**

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(51) **Int. Cl.**

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F21V 17/00	(2006.01)
B60Q 1/06	(2006.01)
F21V 29/00	(2015.01)
F21V 21/00	(2006.01)
F21V 21/04	(2006.01)
F21V 29/70	(2015.01)
F21S 8/02	(2006.01)
F21V 7/04	(2006.01)
F21Y 101/00	(2016.01)

(52) **U.S. Cl.**

CPC ***F21V 21/047*** (2013.01); ***F21S 8/026*** (2013.01); ***F21V 7/041*** (2013.01); ***F21V 29/70*** (2015.01); *F21Y 2101/00* (2013.01)

(58) **Field of Classification Search**

CPC F21Y 2101/02; F21V 21/047; F21V 29/70; F21S 8/026; F21S 8/024; F21S 8/02; F21S 8/022

USPC 362/364

See application file for complete search history.

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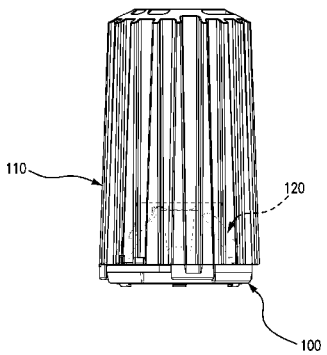
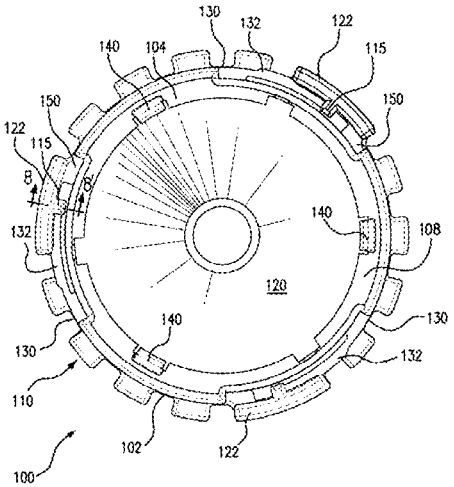
(57) **ABSTRACT**

A recessed lighting optical holder for a recessed lighting fixture, comprises a retainer **100** having a generally annular shape, including a resilient snap projection **105** formed on an inner circumference and resilient beam **130** supported at both ends on an outer circumference. The beam slides into engagement with a heat sink extension **122** on a bottom portion of a circular heat sink **110**, when a top surface of the retainer is positioned against a bottom portion of the heat sink and the retainer is rotated with respect to the heat sink, to lock the retainer to the heat sink. An optic **120** has a generally conical shape, with a bottom portion surrounded by circular lip **125** that snaps into holding engagement with the snap of the retainer, to positively retain the optic. The holder is relatively simple to manufacture and is conveniently accessible for installation and occasional maintenance or replacement.

9 Claims, 9 Drawing Sheets





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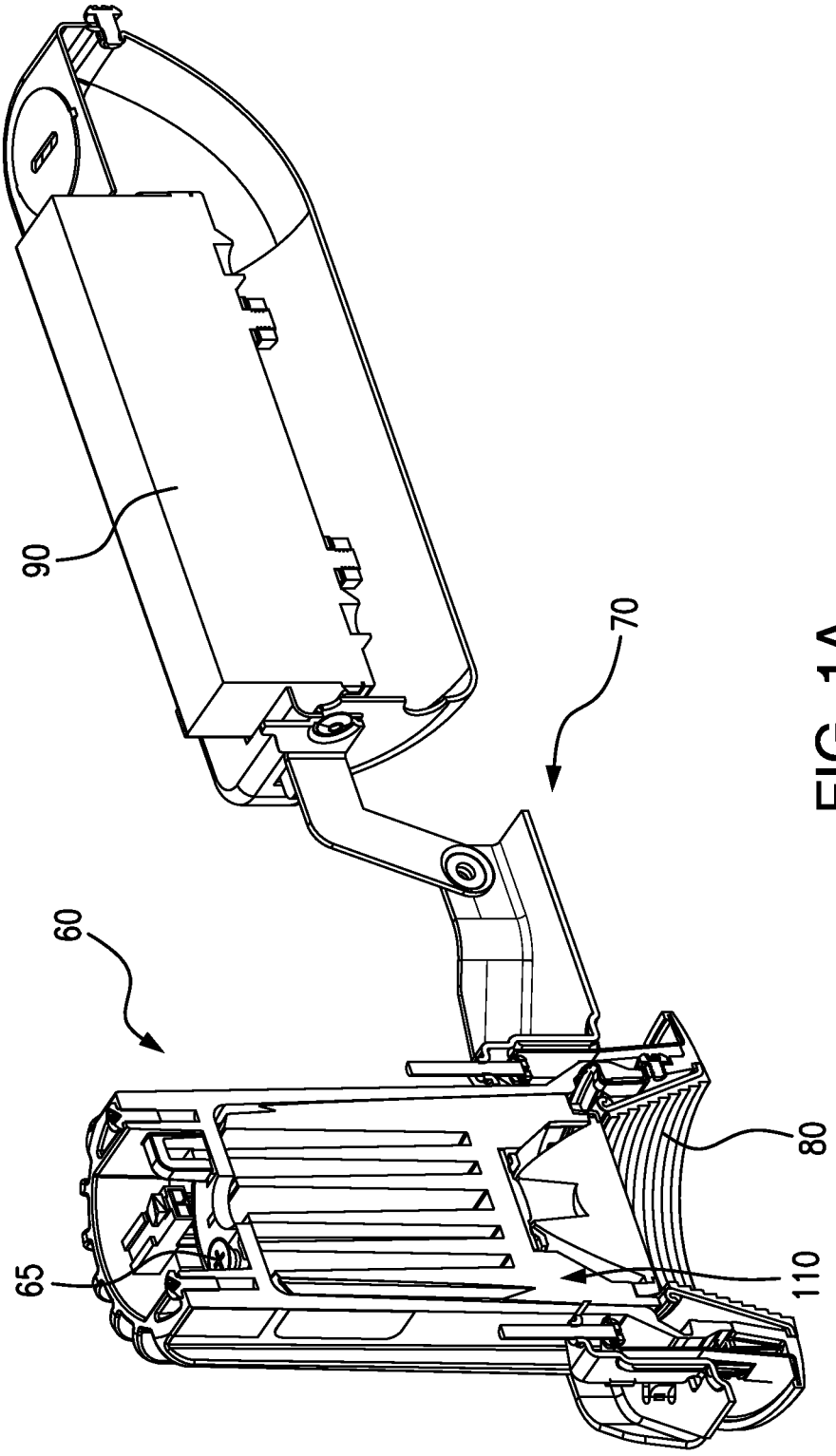

FIG. 1A

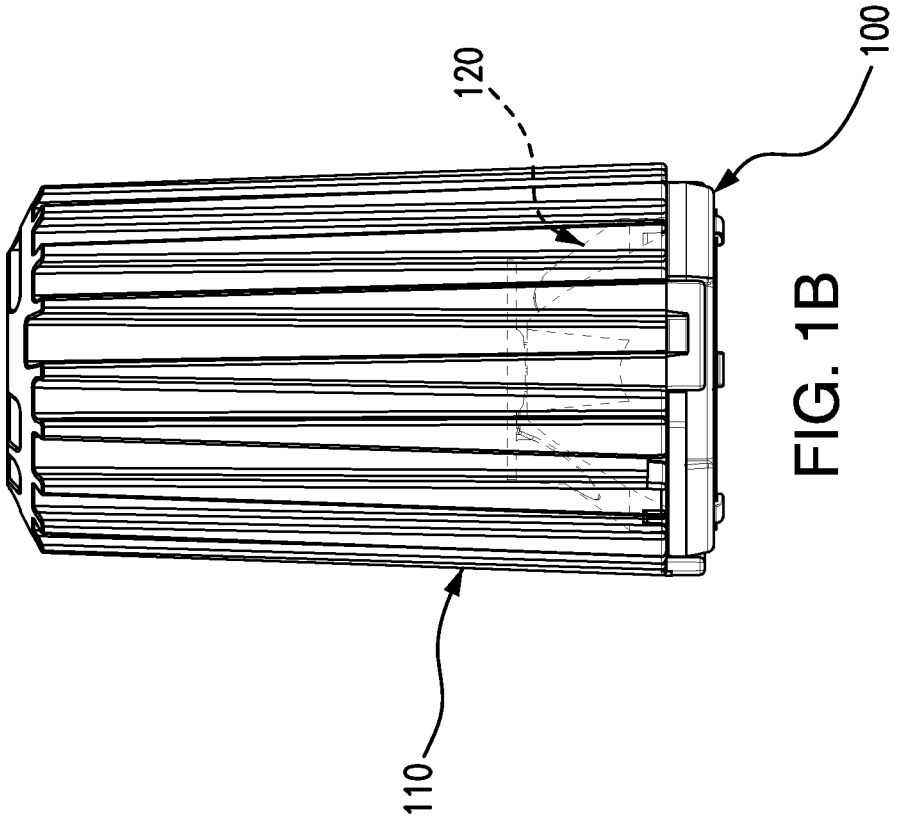

FIG. 1B

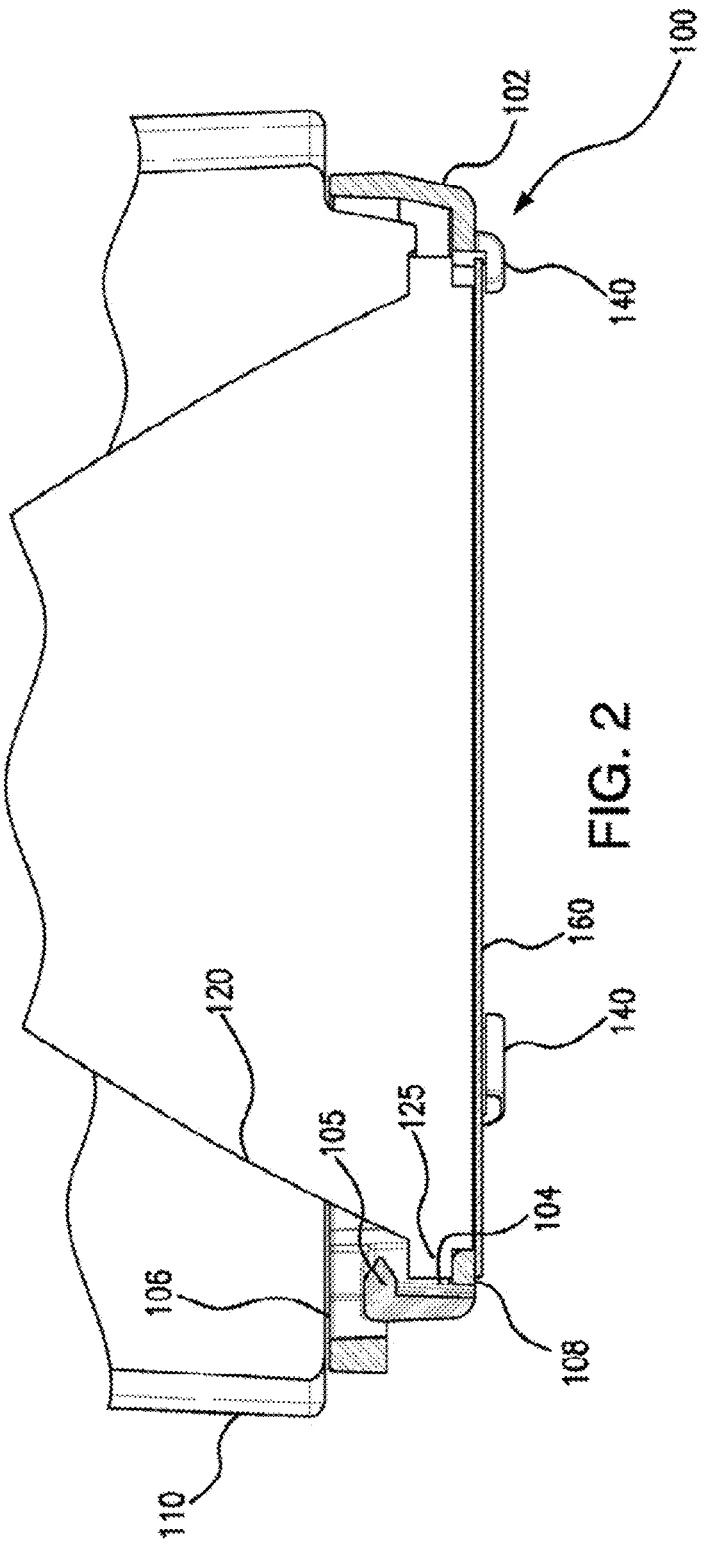

FIG. 2

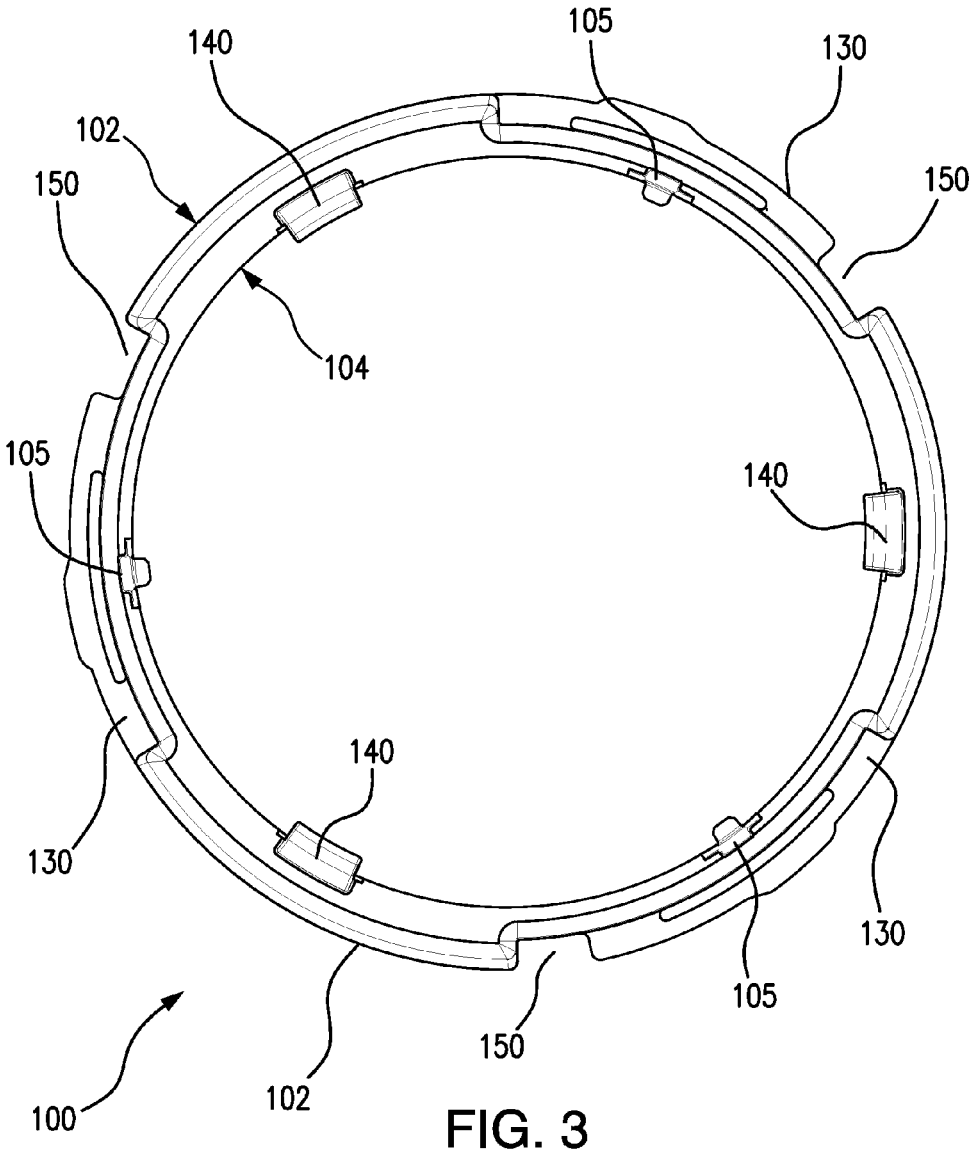

FIG. 3

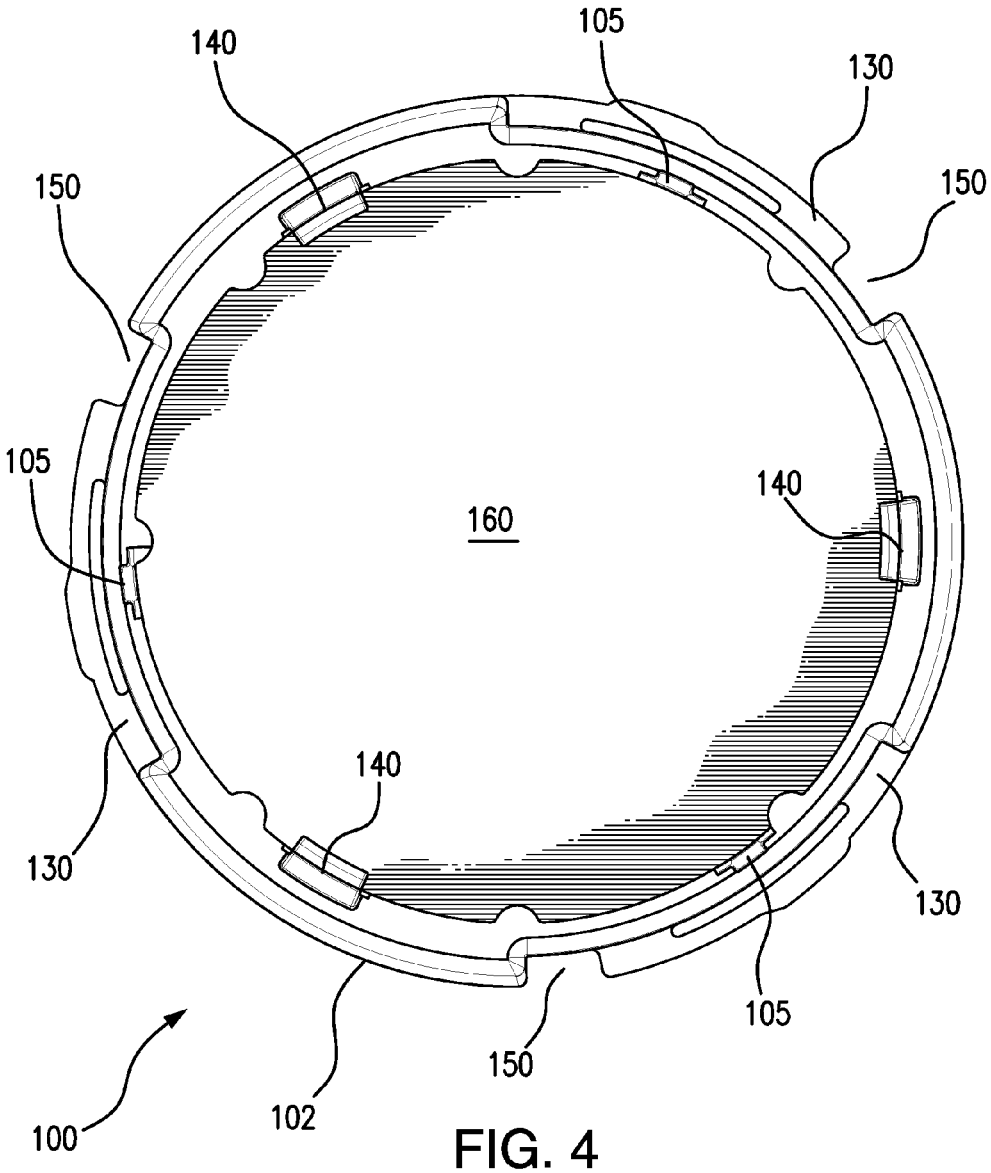

FIG. 4

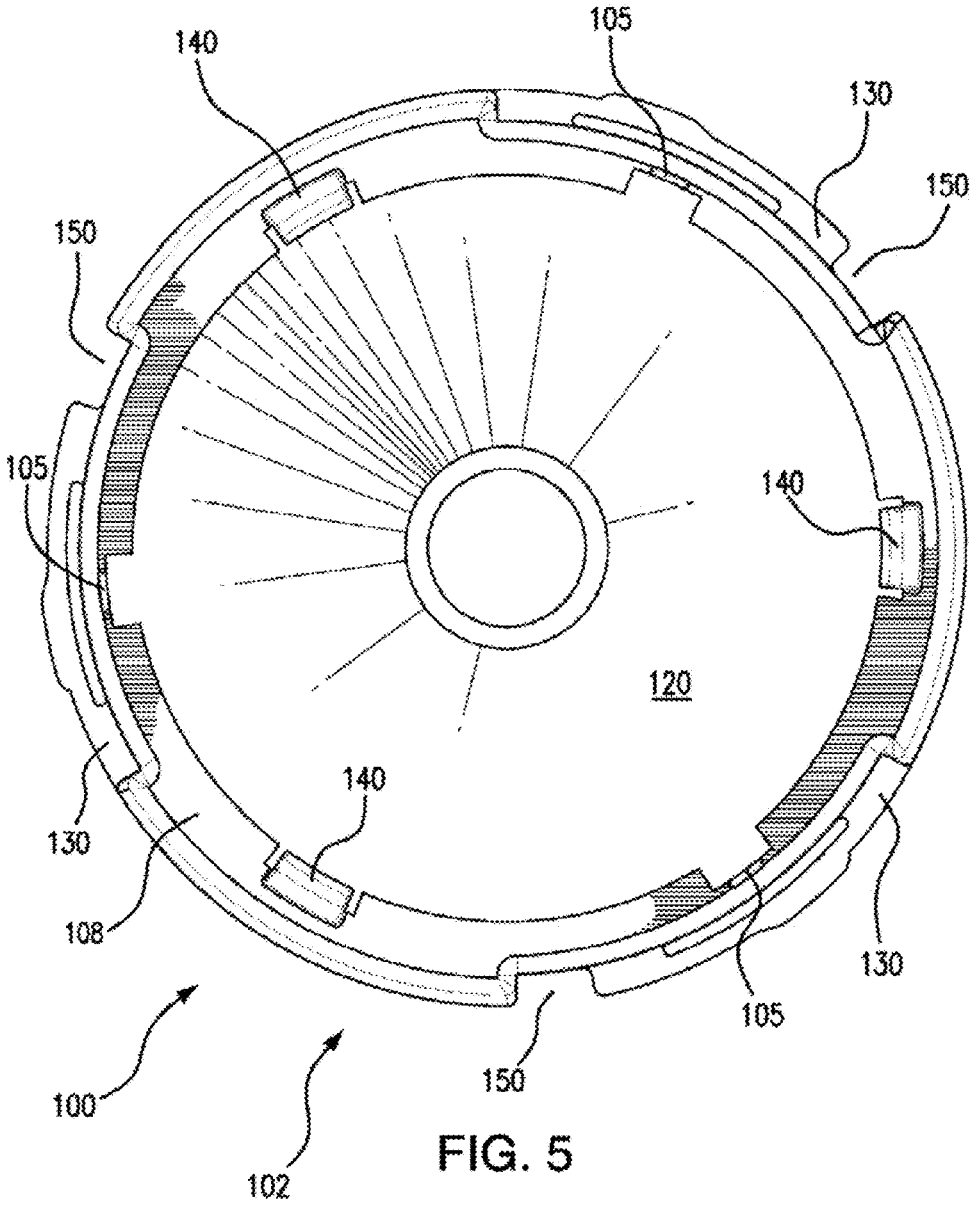

FIG. 5

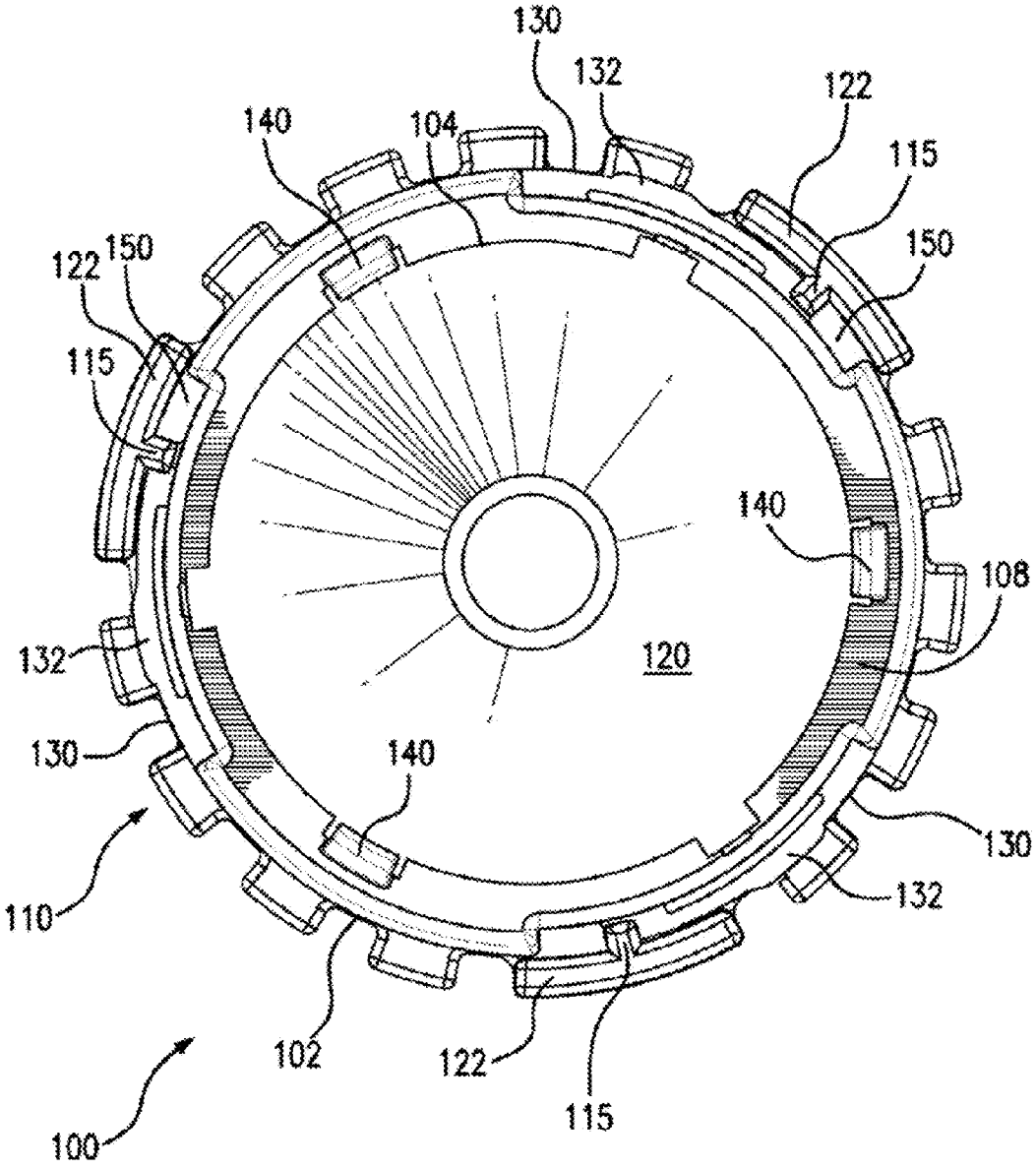
130
132
122
140
104
115
150
122
150
115
140
108
120
132
130
140
130
110
132
102
122
115
100

FIG. 6

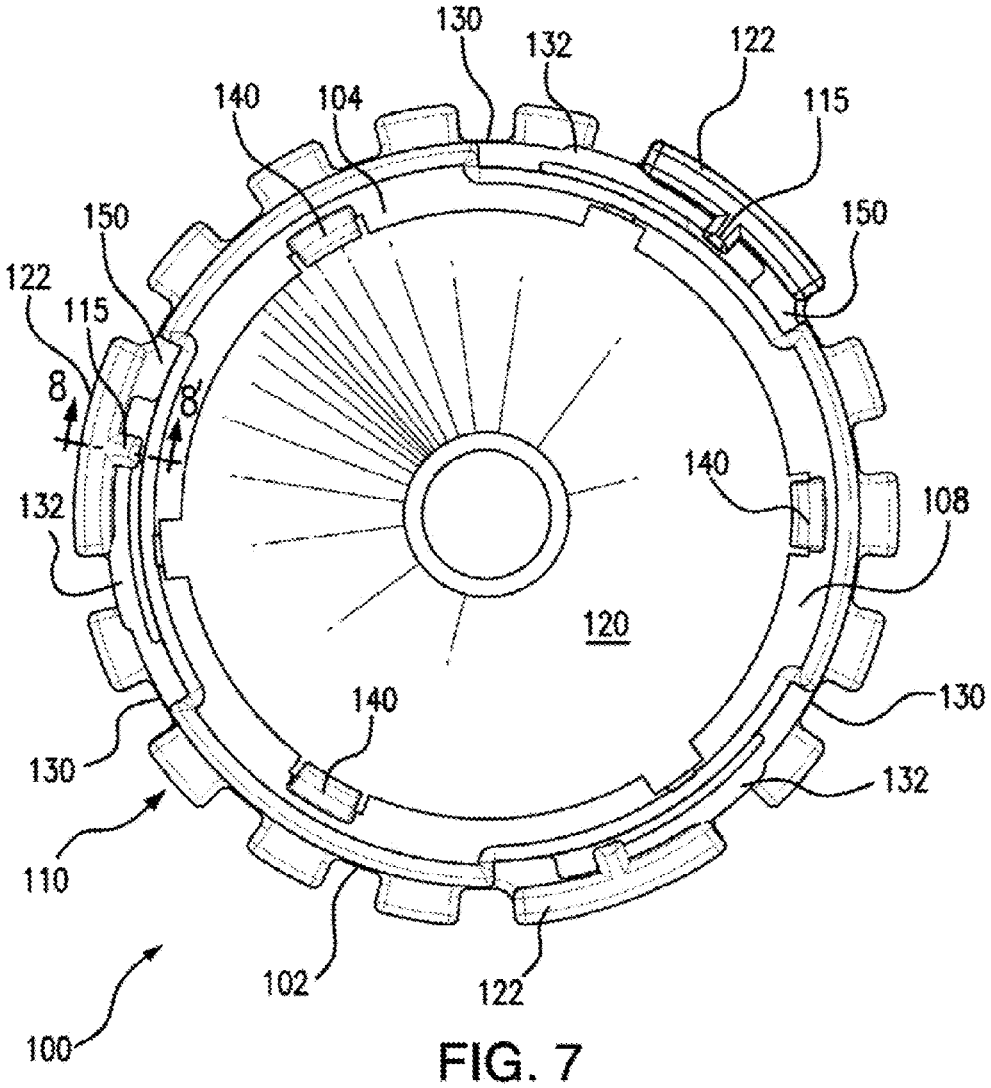
130
132
122
140
104
115
150
150
122
115
8
8'
140
132
108
120
140
130
130
132
110
102
122
100

FIG. 7

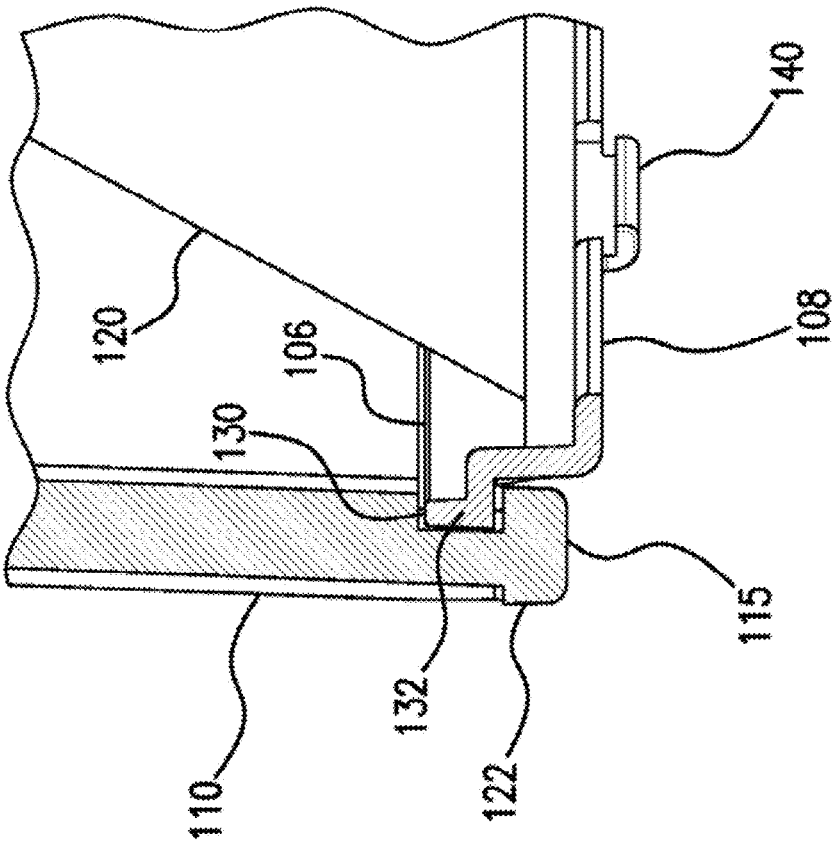

FIG. 8

TWIST LOCK OPTICAL HOLDER FOR RECESSED LIGHTING

This patent application claims benefit under 35 U.S.C. 119(e), of the earlier filing date of U.S. Provisional Patent Application Ser. No. 61/935,000, filed Feb. 3, 2014.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention disclosed relates generally to lighting fixtures and in particular to installation of recessed lighting fixtures.

2. Discussion of the Related Art

Recessed lighting fixtures are designed to be minimally visible from below a ceiling in which they are mounted. LED light sources used for recessed lighting typically generate significant quantities of heat, requiring the use of a heat sink as part of the lighting fixture, to avoid overheating. The LED light source, and an associated reflector referred to as the optic, are typically mounted in the heat sink so as to project light from the bottom of the heat sink. In some designs the heat sink may be supported in a mounting frame that is suspended by bar hangers fastened between joists above the ceiling. The mounting frame is positioned so that the bottom of the heat sink passes through an opening in the ceiling and is approximately flush with the bottom surface of the ceiling. A trim ring typically surrounds the opening in the ceiling, to mask the opening.

The mounting of the optic within the heat sink must be relatively simple to manufacture and be conveniently accessible for initial installation and for occasional maintenance and replacement. Existing examples of LED recessed lighting fixtures may require secondary machining for threaded surfaces and may require tooling for side actions in injection molding manufacturing. Existing examples have the optic and its mounting hardware as separate components, making them inconvenient to initially install, maintain and replace.

Accordingly, there is a need for a device for mounting of the optic within the heat sink, which is relatively simple to manufacture and conveniently accessible for initial installation and for occasional maintenance or replacement.

SUMMARY OF THE INVENTION

Example embodiments of the invention provide an improved recessed lighting optical holder that is relatively simple to manufacture and positively retains the optic for convenient accessibility during installation, maintenance, or replacement.

In accordance with an example embodiment of the invention, a recessed lighting optical holder includes a retainer having a generally annular shape, with an outer circumferential surface, an inner circumferential surface, a top surface, and a bottom surface. The retainer includes a resilient snap projection formed on the inner circumferential surface of the retainer and a resilient beam supported at both ends on the outer circumferential surface of the retainer. The resilient beam is generally shaped as a circular segment that is substantially parallel with the top surface of the retainer. The resilient beam is configured to slide into engagement with a heat sink extension on a bottom portion of a circular inner heat sink of a recessed lighting fixture. When the top surface of the retainer is positioned against the bottom portion of the circular inner heat sink and the retainer is rotated with respect to the inner heat sink, the resilient beam is configured to be deflected by the heat sink extension as the retainer is rotated, to lock the retainer to the inner heat sink.

The recessed lighting optical holder also includes an optic having a generally conical shape, with a narrower top portion and a broader bottom portion. The optic has a circular lip surrounding the bottom portion, which is configured to snap into holding engagement with the resilient snap projection formed on the inner circumferential surface of the retainer. The optic snapped into the retainer forms a unitary optic assembly that is easier to manipulate during installation, maintenance, or replacement.

One end of the resilient beam has a tip that loosely fits against the heat sink extension on the bottom portion of the inner heat sink. The resilient beam has a central portion configured to have an interference fit against the heat sink extension, which causes the central portion of the beam to be deflected by the heat sink extension as the retainer is rotated with respect to the inner heat sink, to lock the retainer to the inner heat sink.

A clearance slot is formed adjacent to one end of the resilient beam. The clearance slot allows clearance for passage of a tab on the heat sink extension on the bottom portion of the circular inner heat sink, when the top surface of the retainer is positioned against the bottom portion of the circular inner heat sink

The retainer includes a bracket formed on the bottom surface of the retainer, the bracket being configured to support an optic film used to color, diffuse, or direct light produced by the recessed lighting fixture.

DESCRIPTION OF THE FIGURES

FIG. **1**A is a perspective view of a recessed light fixture mounted to a lighting mount assembly. The lighting mount assembly is shown connected to an electrical junction box. The figure shows an inner heat sink inserted into the recessed light fixture, which houses a light source, such as an LED and suitable optics, to direct a light beam out of the recessed light fixture.

FIG. **1**B is a side view of the inner heat sink of FIG. **1**A. The figure shows a retainer portion of an optical holder, which has been joined to the bottom of the heat sink and twisted to lock it into position on the heat sink. A conically shaped optic snaps into the retainer, the optic being shown with dotted lines, since it is concealed within the heat sink.

FIG. **2** is a side view, in partial cross section, showing the optic snapped into the retainer and the retainer and optic assembly, joined to the bottom of the heat sink and twisted to lock the assembly into position on the heat sink. The figure shows a resilient snap projection formed on an inner circumferential surface of the retainer, which snaps over a circular lip surrounding the bottom of the conical optic, to hold the optic in place when the retainer is joined to the heat sink. The figure also shows a film or lens that may be positioned in the retainer on a bracket formed on the bottom surface of the retainer.

FIG. **3** is a bottom view of the retainer. The figure shows a resilient beam supported at both ends on an outer circumferential surface of the retainer. The figure shows three resilient snap projections formed on the inner circumferential surface of the retainer. The figure shows three brackets formed on the bottom surface of the retainer, for supporting the film. The figure shows three resilient beams, each supported at both ends on the outer circumferential surface of the retainer, which are configured to lock the retainer into position on the heat sink. For purposes of illustration, the sequence of FIG. **3** to FIG. **7** shows an example of consecu-

tive stages in assembling the film and the optic to the retainer and then joining the retainer assembly to the bottom of the heat sink and twisting the retainer to lock it into position on the heat sink. However, there is no particular sequence that is required for assembly, and either the film or optic may be inserted first.

FIG. **4** is the bottom view of the retainer shown in FIG. **3**, with the film positioned in the retainer, the film being supported by the three supporting brackets.

FIG. **5** is the bottom view of the retainer shown in FIG. **4**, with the film removed to show the optic snapped into the retainer with the three resilient snap projections.

FIG. **6** is the bottom view of the retainer shown in FIG. **5**, with the retainer assembly joined to the bottom of the heat sink. The figure shows a clearance slot adjacent to one end of the resilient beam. The clearance slot allows clearance for passage of a tab on a heat sink extension on the bottom portion of the heat sink, when the top surface of the retainer is positioned against the bottom portion of the heat sink.

FIG. **7** is the bottom view of the retainer and heat sink shown in FIG. **6**, twisted to lock the retainer assembly into position on the heat sink. The figure shows one end of each resilient beam has a tip that loosely fits against the heat sink extension on the bottom portion of the heat sink. The resilient beam has a central portion configured to have an interference fit against the heat sink extension, which causes the central portion of the beam to be deflected by the heat sink extension as the retainer is rotated with respect to the heat sink, to lock the retainer to the heat sink.

FIG. **8** is a side cross sectional view along the section line **8-8'** of FIG. **7**, showing the central portion of the resilient beam configured to have an interference fit against the heat sink extension, which causes the central portion of the beam to be deflected by the heat sink extension as the retainer is rotated with respect to the heat sink, to lock the retainer to the heat sink.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

FIG. **1**A is a perspective view of a recessed light fixture **60** mounted to a lighting mount assembly **70**. The lighting mount assembly **70** is shown pivotally connected to an electrical junction box **90**. The lighting mount assembly **70** and electrical junction box **90** may be configured to be passed through an opening in a wall or ceiling of a room, into an interior space behind the wall or ceiling. The lighting mount assembly **70** may then be fastened behind the wall or ceiling, over the opening.

After the lighting mount assembly **70** has been secured behind the wall, for example, the recessed light fixture **60** may be mounted onto the lighting mount assembly **70** through the wall opening. The recessed light fixture **60** is an example of a canister-type recessed light fixture, which can be mounted using the light mounting assembly **70**.

The figure shows the inner heat sink **110**, which may be inserted into the recessed light fixture **60** and secured inside the recessed light fixture **60**, by means of a fastener, for example the screw **65**. The inner heat sink **110** may house a light source, such as an LED and suitable optics to direct a light beam out of the recessed light fixture **60**. A baffle **80** fastened to the bottom of the recessed light fixture **60**, as shown in the figure, may be used to help direct the light beam into the room in a preferred direction.

FIG. **1**B is a side view of the inner heat sink **110** of FIG. **1**A. The figure shows a retainer portion **100** of an optical holder, which has been joined to the bottom of the heat sink **110** and twisted to lock it into position on the heat sink. A conically shaped optic **120** snaps into the retainer **100**, the optic being shown with dotted lines, since it is concealed within the heat sink **110**.

FIG. **2**, is a side view in partial cross section, showing the optic **120** snapped into the retainer **100** and the retainer and optic assembly, joined to the bottom of the heat sink **110** and twisted to lock the assembly into position on the heat sink. The figure shows a resilient snap projection **105** formed on an inner circumferential surface **104** of the retainer, which snaps over a circular lip **125** surrounding the bottom of the conical optic **120**, to hold the optic in place when the retainer **100** is joined to the heat sink. The figure also shows a film or lens **160** that may be positioned in the retainer **100** on a bracket **140** formed on the bottom surface **108** of the retainer **100**.

For purposes of illustration, the sequence of FIG. **3** to FIG. **7** shows an example of consecutive stages in assembling the film **160** and the optic **120** to the retainer **100** and then joining the retainer assembly to the bottom of the heat sink **110** and twisting the retainer **100** to lock it into position on the heat sink **110**. However, there is no particular sequence that is required for assembly, and either the film **160** or optic **120** may be inserted first.

FIG. **3** is a bottom view of the retainer **100**. The figure shows a resilient beam **130** supported at both ends on an outer circumferential surface **102** of the retainer **100**. The figure shows three resilient snap projections **105** formed on the inner circumferential surface **104** of the retainer **100**. The figure shows three brackets **140** formed on the bottom surface **108** of the retainer **100**, for supporting the film **160**. The figure shows three resilient beams **130**, each supported at both ends on the outer circumferential surface **102** of the retainer **100**, which are configured to lock the retainer **100** into position on the heat sink **110**.

FIG. **4** is the bottom view of the retainer **100** shown in FIG. **3**, with the film **160** positioned in the retainer **100**, the film being supported by the three supporting brackets **140**.

FIG. **5** is the bottom view of the retainer **100** shown in FIG. **4**, with the film **160** removed to show the optic **120** snapped into the retainer **100** with the three resilient snap projections **105**.

FIG. **6** is the bottom view of the retainer **100** shown in FIG. **5**, with the retainer assembly of the optic **120**, film **160** (removed in this view), and retainer **100**, joined to the bottom of the heat sink **110**. The figure shows a clearance slot **150** adjacent to one end of the resilient beam **130**. The clearance slot **150** allows clearance for passage of a tab **115** on a heat sink extension **122** on the bottom portion of the heat sink **110**, when the top surface **106** of the retainer **100** is positioned against the bottom portion of the heat sink **110**. As the retainer **100** rotates clockwise, the resilient beam **130** passes above tab **115**, thus holding the resilient beam **130** and the retainer **100** vertically in place with the heat sink **110**, as shown in FIG. **8**. The resilient beam **130** has a thicker central portion **132** configured to have an interference fit against the heat sink extension **122**, when the retainer **100** is rotated with respect to the heat sink **110**, as shown in FIG. **7**.

FIG. **7** is the bottom view of the retainer **100** and heat sink **110** shown in FIG. **6**, twisted to lock the retainer assembly into position on the heat sink **110**. The figure shows one end of each resilient beam **130** has a tip that loosely fits above the tab **115** and against the heat sink extension **122** (shown in FIG. **8**) on the bottom portion of the heat sink **110**. The resilient beam **130** has the thicker central portion **132** configured to have an interference fit against the heat sink

extension **122**, which causes the central portion **132** of the beam **130** to be deflected by the heat sink extension **122** as the retainer **100** is rotated with respect to the heat sink **110**, to lock the retainer to the heat sink.

FIG. **8** is a side cross sectional view along the section line **8-8'** of FIG. **7**, showing the thicker central portion **132** of the resilient beam **130** configured to have an interference fit against the heat sink extension **122**, which causes the central portion **132** of the beam **130** to be deflected by the heat sink extension **122** as the retainer **100** is rotated with respect to the heat sink **110**, to lock the retainer to the heat sink.

The invention claimed is:

1. A recessed lighting optical holder, comprising:

(a) a retainer having

a generally annular shape that includes an outer circumferential surface that is generally cylindrical except at locations of one or more clearance slots,

an inner circumferential surface,

a top surface, and

a bottom surface,

the retainer including

a resilient snap projection on the inner circumferential surface of the retainer and

one or more resilient beams, each of the resilient beams being located at least partially within a corresponding one of the one or more clearance slots in the outer circumferential surface of the retainer,

each of the one or more resilient beams being generally shaped as a circular segment,

each resilient beam of the one or more resilient beams being attached to the retainer at a first radial end and a second radial end of the resilient beam, such that a radial gap forms between the retainer and the resilient beam, between the first radial end and the second radial end of the resilient beam,

each of the one or more resilient beams being configured to slide into engagement with a heat sink extension on a bottom portion of a circular heat sink, when the top surface of the retainer is positioned against the bottom portion of the circular heat sink and the retainer is rotated with respect to the heat sink,

each of the one or more resilient beams being configured to be deflected by the heat sink extension as the retainer is rotated, to lock the retainer to the heat sink; and

(b) an optic having a generally conical shape, with a narrower top portion and a broader bottom portion, having a circular lip surrounding the bottom portion,

the circular lip being configured to snap into holding engagement with the resilient snap projection formed on the inner circumferential surface of the retainer.

2. The recessed lighting optical holder of claim **1**, wherein

one end of each of the one or more resilient beams has a tip that loosely fits against the heat sink extension on the bottom portion of the heat sink,

each of the one or more resilient beams has a thicker central portion disposed radially outward from the radial gap,

such that the thicker central portion is deflected into the radial gap, forming a radial interference fit of the thicker central portion against the heat sink extension as the retainer is rotated with respect to the heat sink.

3. The recessed lighting optical holder of claim **1**, wherein each of the one or more clearance slots allows clearance for passage of a tab on the heat sink extension on a bottom portion of the circular heat sink, when the top surface of the retainer is positioned against the bottom portion of the circular heat sink.

4. The recessed lighting optical holder of claim **3**, wherein as the retainer is rotated with respect to the heat sink, the resilient beam passes above the tab on the heat sink extension, the tab being configured to hold the resilient beam and the retainer vertically in place with the heat sink.

5. The recessed lighting optical holder of claim **3**, further comprising the circular heat sink, wherein:

the circular heat sink comprises the bottom portion, the heat sink extension and the tab on the heat sink extension; and

the tab extends radially inward from a lowest point of the heat sink extension.

6. The recessed lighting optical holder of claim **5**, wherein the heat sink is configured to be inserted into a recessed light fixture and secured inside the recessed light fixture with a fastener.

7. The recessed lighting optical holder of claim **5**, wherein the heat sink forms a cavity for installation of the optic.

8. The recessed lighting optical holder of claim **1**, wherein the retainer includes a bracket formed on the bottom surface of the retainer, the bracket being configured to support an optic film.

9. A retainer for retaining an optic to a circular heat sink of a recessed lighting optical holder, comprising:

a retainer body having a generally annular shape that includes:

(a) an upper section that forms an outer circumferential surface, the outer circumferential surface being generally cylindrical except at locations of one or more clearance slots, wherein the upper section of the retainer comprises one or more resilient beams, each of the one or more resilient beams:

being at least partially within a corresponding one of the one or more clearance slots;

being generally shaped as a circular segment;

being attached to the outer circumferential surface of the retainer at a first radial end and a second radial end of the resilient beam, such that a radial gap forms between the retainer body and the resilient beam, between the first radial end and the second radial end of the resilient beam; and

being configured to slide into engagement with corresponding portions of the circular heat sink when the top surface of the retainer is positioned against the circular heat sink and the retainer is rotated with respect to the heat sink, such that each of the one or more resilient beams is deflected toward the radial gap by the circular heat sink as the retainer is rotated, the deflection forming a radial interference fit that secures the retainer to the heat sink; and

(b) a lower section that forms a bottom surface and an inner circumferential surface;

wherein the lower section forms a plurality of resilient snap projections for retaining the optic to the retainer body.

* * * * *